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Asian Journal of Animal and Veterinary Advances

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Asian Journal of Animal and Veterinary Advances 8 (7): 893-903, 2013
ISSN 1683-9919 / DOI: 10.3923/ajava.2013.893.903

Factors Explaining Dairy Cattle Adoption Behaviour among Smallholder Farmers in Kenya

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ABSTRACT

Milk is an essential food in the nutrition and diet of many Kenyans. Dominance of indigenous breed hampers every effort to increase milk productivity as a major way for enhancing nutritional status of poor households, especially those in rural areas. In this study, factors influencing dairy cattle adoption behavior among smallholder farmers in rural Kenya were analyzed. The data comprised of 251 cattle farmers and were analyzed with probit regression. Results show that average cattle owned slightly increased over the years in both local and dairy breeds. Probit regression results showed that marginal parameters of residence in Busia district (-0.4019), being married (0.2592), number of boys (0.0788), number of cattle (-0.1194) and having food problem (-0.3160) were statistically significant ($p<0.05$). It was concluded that although dairy cattle offer opportunities to increase milk productivity in rural Kenya, adoption is still low. Also, integrated efforts to reduce persistent hunger and poverty among smallholder farmers in rural Kenya will go a long way in enhancing households' adoption decision.

Key words: Dairy cattle, indigenous cattle, adoption, Kenya

INTRODUCTION

In Kenya, agriculture is a dominant economic sector which accounts for more than 30% of annual Gross Domestic Products (GDP), more than 50% of foreign exchange earnings and about 75% of the country's labour force (Government of Kenya, 2010; McSherry and Brass, 2007). Despite facing several production, processing, marketing and other institutional constraints, livestock sub-sector remains a vital source of economic growth (Karanja, 2003) and obviously one of the best organized in Sub-Saharan Africa (Leksmono *et al*., 2006). Estimates revealed that while accounting for about 30% of agricultural Gross Domestic Product (GDP), the livestock sub-sector contributes about 10-12 percent of the national GDP (Ministry of Livestock Development (MoLD), 2006; Kiptarus, 2005; Leksmono *et al*., 2006; McSherry and Brass, 2007). Similarly, dairy aspect of livestock sub-sector contributes about 3.5% of total GDP, which is about 14% of agricultural GDP (Hooton, 2004).

Specifically, activities in the dairy segment of the livestock sub-sector have witnessed significant growth and are considered very critical for Kenya's economic development agendas. However, until 2009 when national livestock census was carried out (Behnke and Muthami, 2011), inadequate statistics on cattle population, the quantity of milk produced, consumed and marketed marred efforts for strategic planning in the dairy industry (EADD, 2008). Some estimates from the Ministry of Livestock and Fisheries Development put the number of milking cattle at 3.5 billion, while Smallholder Dairy Project (SDP) contended that actual number may double this official figure.

Similarly, Food Agricultural Organization (FAO) estimated 5.5 billion milking animals. Therefore, due to these contentious statistics, productivity assessment in the dairy industry was very difficult (EADD, 2008). In 2009, as part of the national population census, headcount of livestock in Kenya was undertaken. The census revealed that there were 17,467,774 cattle, 17,129,606 sheep, 27,740,153 goats and 2,971,111 camels (Behnke and Muthami, 2011).

In addition, the livelihoods of Kenya's pastoralists, who constitute about 25% of the country's population predominantly revolve around livestock husbandry with some panoptic biases for cattle, sheep, goats and camels. In many African countries, cattle play significant roles in households' livelihoods as a major means of food and nutrition, income, assets and storage of wealth, security from income shocks and performance of some social, aesthetic and cultural functions (Jahnke, 1982; Behnke and Muthami, 2011). Livestock husbandry in Kenya is also largely confined to arid and semi-arid lands, which constitute about 80% of the country's total land area and accounts for over 50% of total livestock population (Anonymous, 2012).

Among the major livestock products, milk is a significant source of income for several small-scale subsistence farmers that often live at the margin of poverty. Erratic rainfall, droughts and other welfare shocks expose majority of pastoralists to poverty, which is often aggravated by high level of illiteracy and peculiar dysfunction of social amenities like road, electricity, pipe water etc (McSherry and Brass, 2007). More than 650,000 of such farmers primarily depend on income from dairy products for their livelihoods (KDB, 2008), while more than 350,000 are annually involved in several value chain activities such as milk collection, transportation, processing and marketing (SDP, 2004). Similarly, the significance of dairy milk for human nutrition is well conceived from its high nutrient composition as a widely desired food among poor households. Dairy milk is a dominant source of locally processed milk with high tendency of being sold at informally organized local and peri-urban markets (KDB, 2008; McSherry and Brass, 2007).

Obviously, milk constitutes a significant proportion of households' diets in Kenya, where daily consumption exceeds average intakes in many developing countries (SDP, 2004; McSherry and Brass, 2007). Some statistics have shown that an average Kenyan is expected to annually drink about 100 kilograms of milk, which represents four times the average for Sub-Saharan Africa (SDP, 2004). The potentials of the formal markets where processed milk is sold to urban residents and informal markets where raw milks are locally processed and sold to poor households with majority in rural areas have not been fully explored due to some milk production constraints (Leksmono *et al*., 2006; McSherry and Brass, 2007).

Over the years, however, the values of milk produced in Kenya had grown in leaps and bounds from Ksh 23.1 billion in 1995 (Kodhek, 1999) to Ksh 35.2 billion (2.3 billion litres) in 2000 (Republic of Kenya, 2002). In 2007, it was estimated that 3.5 billion liters of milk were produced which translated into annual average of 564 kg yield per cow. It should however be noted that when compared with annual yields in South Africa and Argentina where annual milk yield per cow ranges between 2,500 and 3,500 kg and USA with annual average of 9,000 kg per cow, milk yield in Kenya is abysmally low (EADD, 2008). It should be noted that in 1992, Government of Kenya liberalized the dairy industry with attendant restructuring of institutional procedures in respect of milk collection, processing and marketing (EADD, 2008). Kenyan government's aspirations for exploring more productivity potentials in the livestock sub-sector were clearly accentuated in the country's vision 2030, which inter alia seeks to enhance international competitiveness of the country's livestock products through veritable exploration of different dynamics of agricultural markets and preponderant value chains.

Ever since European settlers introduced exotic cattle breed into Kenya in 1902 (Van der Valk, 2008), efforts to increase milk production had focused on introduction of exotic breeds and crosses (generally referred to as dairy cattle) which are expected to attain maturity earlier due to better genetic composition and produce more milk per unit time. Specifically, each breed has its advantages and disadvantages. For instance, indigenous cattle produces better meat, less milk and possesses high resistance to diseases, while exotic breed produces more milk and are with less resistance to diseases (Kumsa and Addis Ababa Chamber of Commerce, 2008). The implication therefore is that in absence of adequate management practices and required solvency for mitigating some effects of production risks and uncertainties, high mortality among exotic/crosses breed can be so high, thereby neutralizing any gains from expected higher productivity.

Karanja (2003) submitted that in Kenya, indigenous zebu cattle and dairy cattle are the two main types of cattle that are kept for milk production. It was further noted that dairy cattle constitute about 30% of total cattle population but account for about 60% of national milk production, while the remaining portion is contributed by indigenous Zebu cattle which are largely owned in rural areas and account for about 70% of total cattle population. Due to pervasive poverty among farm population especially Kenyan rural pastoralists, initiatives for keeping exotic breeds of dairy cattle may be lacking. This is critical from the view point of higher maintenance cost and higher mortality rate of their calves. Poor smallholder farmers are also generally illiterate, lacking access to improved water sources which can enhance optimization of hygienic practices. This study therefore seeks to determine the factors influencing ownership of dairy cattle among smallholder farmers in Kenya.

MATERIALS AND METHODS

Data: Data for this study were collected by International Food Policy Research Institute (IFPRI). The data were downloaded from IFPRI's website after obtaining the necessary permission for its exclusive research utilization. Davis *et al.* (2010) provided complete methodological approaches for data collection. Specifically, two-stage random sampling approach was used for selecting rural household that participated in the survey. The questionnaire was pre-tested for consistency and validity. In this study, dataset for Kenya which were originally collected from 398 households were used. The distribution of the respondents across the districts was such that 6 households were sampled from Butere-Munias, 169 from Kalamega, 115 from Bungoma and 118 from Busia. A subset of cattle farmers in the dataset was used in this study and this comprises 251 farmers with 5 from Butere-Munias, 97 from Kalamega, 68 from Bungoma and 81 from Busia.

Specification of estimated model: Probit regression method was used for estimating the parameters of included variables due to the dichotomous nature of the dependent variable (coded as 1 if raising exotic/crosses and 0 otherwise). The Maximum Likelihood Estimates (MLE) is used in estimating the parameters due to inappropriateness of Ordinary Least Square (OLS). Following Spearmann (2009), Probit model is based on latent model which can be expressed as (Eq. 1-4):

$$P(Z_i = 1 \mid x) = (z_i^* > 0 \mid x) \quad (1)$$

$$= P(x_i'+\varepsilon_i > 0 \mid x) \quad (2)$$

$$= P(\varepsilon_i > x_i'\beta \mid x) \quad (3)$$

$$= 1\text{-}F\ (x_i'\beta) \quad (4)$$

The error terms are normally distributed and independent, therefore Eq. 5:

$$P(z_i = 1 \mid x) = 1 - \phi\left(-\frac{x_i'\beta}{\sigma}\right),\ \sigma \equiv 1 \quad (5)$$

because of symmetry assumption Eq. 6:

$$1 - \phi\left(-\frac{x_i'\beta}{\sigma}\right) = \phi\,(x_i'\beta) \quad (6)$$

z_i is the dependent variable coded as 1 if keeping dairy cattle (exotic/crosses breed) and 0 otherwise. x's are the independent variables specified as: Bungoma district (yes = 1, 0 otherwise), Busia district (yes = 1, 0 otherwise), married (yes = 1, 0 otherwise), age of household heads (years), primary education (yes = 1, 0 otherwise), secondary education (yes = 1, 0 otherwise), tertiary education (yes = 1, 0 otherwise), farming as primary occupation (yes = 1, 0 otherwise), number of male adults, number of female adults, number of boys, number of girls, income realized from agricultural labour (yes = 1, 0 otherwise), having permanent job (yes = 1, 0 otherwise), income realized from brick, charcoals and fuel wood (yes = 1, 0 otherwise), income realized from local brew (yes = 1, 0 otherwise), income realized from businesses (yes = 1, 0 otherwise), income realized from relatives (yes = 1, 0 otherwise), number of cattle, size of land (hectares) and had food problem (yes = 1, 0 otherwise).

The marginal parameters represent the effect of a unit change in an independent variable on the probability P (Z = 1 | X = x) given that all other variables are held constant. These can be computed as (Eq. 7):

$$\frac{\delta P(z_i = 1 \mid x_i)}{\delta x_i} = \frac{\delta E(z_i \mid x_i)}{\delta x_i} = \varphi(x_i'\beta)\beta \quad (7)$$

In STATA 12.0 software which was used for data analysis, marginal parameters were computed by invoking mfx command after running the standard probit regression.

RESULTS AND DISCUSSIONS

Demographic characteristics of cattle farmers: Tables 1 shows the distribution of cattle farmers' demographic characteristics across the districts and the combined data. In the pooled data, 78.49% of the farmers were married. However, all the respondents from Butere-Mumias were married, while 83.82% were married in Bungoma district. Household heads that were widows constituted 19.12% in the combined data, while 27.16% indicated this in Busia district. Also, 83.67% of the household heads were headed by males. All households from Butere-Mumias were headed by males. This may have resulted from the smallness of the number of respondents from that district. However, 86.76, 82.47 and 81.48% were headed by males in Bungoma, Kakamega and Busia, respectively. These findings reflect the patriarchal nature of Kenyan societies (IEA, 2008). However, gender of the household heads often influences access to production resources. In some

Table 1: Percentage distribution of some demographic variables of cattle farmers

Demographic variables	Bungoma	Busia	Butere mumias	Kakamega	Total
Marital status					
Divorced	0.00	1.23	0.00	0.00	0.40
Married	83.82	69.14	100.00	81.44	78.49
Single never married	1.47	2.47	0.00	2.06	1.99
Widowed	14.71	27.16	0.00	16.49	19.12
Geuder of household heads					
Male	86.76	81.48	100.00	82.47	83.67
Female	13.24	18.52	0.00	17.53	16.33
Age of household heads					
<40	19.12	14.81	40.00	20.62	18.73
40<50	29.41	33.33	40.00	30.93	31.47
50<60	30.88	37.04	0.00	24.74	29.88
60<70	11.76	8.64	20.00	16.49	12.75
>=70	8.82	6.17	0.00	7.22	7.17
Average age	50.10	50.01	45.80	49.81	49.88
Educatiou					
No education	5.88	11.11	0.00	6.19	7.57
Primary education	30.88	70.37	80.00	54.64	53.78
Secondary education	44.12	14.81	20.00	34.02	30.28
Tertiary education	19.12	3.70	0.00	5.15	8.37
Employmeut					
Casual labour	0.00	2.47	0.00	2.06	1.59
Civil service	10.29	4.94	0.00	3.09	5.58
Farmer	70.59	83.95	100.00	68.04	74.50
Masonary	1.47	0.00	0.00	0.00	0.40
Private	4.41	0.00	0.00	14.43	6.77
Retiree	10.29	1.23	0.00	5.15	5.18
Trade/business	2.94	7.41	0.00	7.22	5.98

previous studies, Doss (2001) and Doss and Morris (2001) found that due to several constraints in having access to production resources, female headed households were less productive than their male counterparts.

Table 1 further reveals that in Bungoma and Busia districts, the highest proportion of the household heads belonged to age group 50<60 years with 30.88 and 37.04%, respectively. However, in Kakamega, the age group 40<50 years had highest proportion of 30.93%. In the combined data, majority of the household heads (31.47%) belonged to age group 40<50 years. Across the districts, Kakamega and Bungoma had the highest proportions of 20.62 and 19.12% being less than 40 years of age. However, Bungoma had the highest proportion (8.82%) of the household heads being 70 years and above. Average ages of household heads was 49.88 years in the combined data while Bungoma district was with the highest average value (50.10 years).

Education is an important factor motivating adoption of technology (Baltenweck and Staal, 2000). Table 1 shows that while 7.57% of the farmers in the combined data had no formal education and the highest proportion of 11.11% was from Busia district. In addition, 53.78% of the respondents in the combined data had primary, while 30.28% had secondary education. At the district level, majority of the farmers from Burere-Mumias (80.00%) and Busia (70.37%) had primary education, while 44.12% had secondary education from Bungoma district. Tertiary education was attained by 19.12% of the farmers from Bungoma district.

Table 2: Other form of livelihoods engaged by cattle farmers in Kenya

	Bungoma	Busia	Butere-Mumias	Kakamega	Total
Agricultural labour	32.35	69.14	80.00	45.36	50.20
Income from crafts, tailoring etc	17.65	12.35	40.00	22.68	18.33
Income from brick, charcoals, fish, fuel wood	30.88	41.98	0.00	25.77	31.87
Income from brewery	5.88	2.47	0.00	1.03	2.79
Income from shop	11.76	6.17	0.00	16.49	11.55
Income from business	19.12	6.17	20.00	23.71	16.73
Income from selling food	17.65	28.40	60.00	13.40	20.32
Income from relatives	36.76	67.90	100.00	55.67	55.38

Table 1 also shows the distribution of cattle farmers' occupation across the selected districts. It reveals that farming was a dominant occupation with 74.50% participation in the combined data. In addition, all the households from Butere-Mumias were engaged in farming, while 83.95 % did same in Busia district. It is also worthy to note that 10.29 and 5.18% of the farmers from Bungoma and Kakamega were retirees. Trading and businesses were primarily engaged by 5.98 percent of all the cattle farmers. However, 7.41 and 7.22% of the farmers from Busia and Kakamega districts were involved in trading/businesses.

Involvement in other income generating activities: In Kenya, incomes from agricultural enterprises constitute about 60% of the total household income (Kuyiah *et al*., 2006). Livelihood diversification is one of the major responses of farmers to revert economic destitution and poverty. In rural Kenya, this is of high significance given high rural poverty level which is sometimes synonymous to being engaged in agriculture (IFAD, 2011). Table 2 shows the different sources of income being utilized by the farmers. In the combined data, 50.20% of the households were offering their surplus labours for wages on other people's farms. Because many rural households jointly hold farm resources and allocate them collectively for the utmost benefit of everyone, it is possible for some household members to be released to work on someone else's farms for some cash benefits. At the district level, 69.14% of the households from Busia realized income from sale of family labour by working as daily paid casual labour on other people's farms.

The table further shows that incomes were realized from craft works, tailoring, carpentry etc., Due to growing relevance of tourism in Kenyan economy, involvement in handicraft works is becoming notable sources of income with high potentials for employment and wealth creation (Rotich, 2012). Specifically, 18.33% of the combined households were realizing incomes from craft works. In Kakamega and Bungoma districts, 22.68 and 17.65% of the farmers, respectively realized some incomes from craft works. Incomes were also realized from bricks by 31.87% of the combined farmers. However, 41.98 and 30.88% of the farmers from Busia and Bungoma districts realized incomes from bricks and other activities. Only 2.79% of the farmers realized incomes from selling local brew, while 11.55% did realize money from shops and bars. Involvement in business was indicated by 23.71 and 19.12% of the respondents from Kakamega and Bungoma, respectively. Selling food generated some incomes for 28.40% of the farmers from Busia district. Remittances were received by 55.38% of the combined farmers. Specifically, all the farmers from Butere-Mumias indicated that they received remittances, while 67.90 and 55.67% were for Busia and Kakamega, respectively.

Modes of cattle acquisition across the selected Kenyan districts and breeds: Different modes were indicated by the farmers for acquiring cattle. Table 3 shows the distribution of different

Table 3: Descriptive statistics of livestock owned

	Bungoma		Busia		Butere-mumias		Kakamega		All	
Districts	Mean	Std dev	Mean	Std dev	Mean	Std dev	Mean	Std dev	Mean	Std dev
Livestock No. in 2005	2.79	3.41	2.35	3.56	1.00	0.00	2.32	2.48	2.43	3.10
Livestock in 2008	3.01	3.10	3.31	2.72	1.80	1.10	2.76	1.97	2.99	2.56
Livestock born between 2005 and 2008	1.21	2.21	1.31	1.42	2.60	1.95	1.46	0.97	1.37	1.55
Livestock acquired between 2005 and 2008	0.32	0.70	0.28	0.64	0.60	0.55	0.52	0.69	0.39	0.68
Livestock sold between 2005 and 2008	0.85	1.70	0.53	1.04	0.60	1.34	1.11	1.34	0.84	1.38
Livestock consumed between 2005 and 2008	0.13	0.77	0.05	0.27	0.00	0.00	0.06	0.35	0.08	0.48
Land size	19.95	22.20	35.49	22.85	5.60	8.05	5.61	11.51	19.14	22.64

Table 4: Cattle owned by farmers across the types of livestock breeds

Nature of acquisition	Type of breed	Frequency	Mean	Standard deviation
Livestock owned in 2005	Local breed	159	3.04	3.495
	Dairy cattle	92	1.38	1.857
	Total	251	2.43	3.101
Livestock owned in 2008	Local breed	159	3.59	2.860
	Dairy cattle	92	1.95	1.417
	Total	251	2.99	2.556
Livestock born between 2005 and 2008	Local breed	159	1.45	1.727
	Dairy cattle	92	1.22	1.194
	Total	251	1.37	1.555
Livestock acquired between 2005 and 2008	Local breed	159	0.44	0.734
	Dairy cattle	92	0.30	0.569
	Total	251	0.39	0.680
Livestock sold between 2005 and 2008	Local breed	159	0.96	1.560
	Dairy cattle	92	0.65	0.966
	Total	251	0.84	1.378
Livestock consumed between 2005 and 2008	Local breed	159	0.09	0.560
	Dairy cattle	92	0.04	0.293
	Total	251	0.08	0.480

modes for acquiring cattle. In 2005, average cattle owned by the combined farmers was 2.43 cattle heads, which increased to 2.99 cattle heads in 2008. In Bungoma district, the number of cattle owned increased from 2.79-3.01 between 2005 and 2008. Between 2005 and 2008, average of 1.37 cattle was born while 0.38 was acquired. Average cattle sold between 2005 and 2008 was 0.84, while average of 0.08 was consumed.

Table 4 shows the distribution of cattle owned between 2005 and 2008 across the breed. It reveals that in 2005, average local and dairy cattle owned were 3.04 and 1.38, respectively. However, in 2008, average local breed and dairy cattle owned were 3.59 and 1.95, respectively. Between 2005 and 2008, average newly born calves were 1.45 and 1.22, respectively while the ones acquired were 0.44 and 0.30. Average of sold livestock among local and dairy cattle were 0.96 and 0.65, respectively while 0.09 and 0.04 were consumed.

Table 5: Results of probit regression analysis of factors influencing ownership of exotic cattle breed

	Standard probit parameters			Marginal parameters		
Variables	Coefficient	SE	z-statistics	Coefficient	SE	z-statistics
Bungoma district	-0.3748	0.2769	-1.35	-0.1114	0.0759	-1.47
Busia district	-1.6047***	0.3762	-4.27	-0.4019***	0.0685	-5.87
Married	1.0495***	0.3390	3.1	0.2592***	0.0604	4.3
Age of household heads	0.0052	0.0101	0.51	0.0017	0.0032	0.52
Primary education	-0.4118	0.4328	-0.95	-0.1317	0.1387	-0.95
Secondary edncation	-0.1827	0.4735	-0.39	-0.0566	0.1426	-0.4
Tertiary education	0.8624	0.6630	1.3	0.3184	0.2573	1.24
Farming as occupation	0.3819	0.2704	1.41	0.1129	0.0739	1.53
No. of male adults	0.1082	0.1288	0.84	0.0344	0.0411	0.84
No. of female adults	-0.1551	0.1163	-1.33	-0.0493	0.0368	-1.34
No. of boys	0.2449***	0.0742	3.3	0.0778***	0.0233	3.34
No. of girls	0.1117	0.0831	1.34	0.0355	0.0267	1.33
Agriclabor income	-0.1158	0.2354	-0.49	-0.0368	0.0748	-0.49
Permanent job	-0.3914	0.3237	-1.21	-0.1127	0.0834	-1.35
Income from brick	-0.4130*	0.2371	-1.74	-0.1241*	0.0670	-1.85
Income from brew	0.6836	0.6905	0.99	0.2520	0.2733	0.92
Income from business	0.1523	0.2709	0.56	0.0500	0.0916	0.55
Income from relative	0.1336	0.2246	0.59	0.0422	0.0706	0.6
No. of cattle	-0.3756***	0.0722	-5.2	-0.1194***	0.0208	-5.73
Size of land	0.0081	0.0062	1.31	0.0026	0.0020	1.32
Food problem	-0.8700**	0.3420	-2.54	-0.3160**	0.1305	-2.42
Coustant	0.0316	0.9575	0.03	-	-	-
LR chi 2 (21)	124.76					
Prob>chi2	0.0000					
Pseudo R2	0.3816					
Log likelihood	-101.0874					

*: Statistically significant at 10%, **: Statistically significant at 5%, ***: Statistically significant at 1%

Factors influencing ownership of dairy cattle: Table 5 shows the results of the probit regression. The results show that the model produced a good fit of the data as reflected by the statistical significance ($p<0.01$) of the computed likelihood Ratio Chi Square. Out of the included independent variables, the parameter of Busia district shows statistical significance ($p<0.01$). It implies that compared to those from Kakamega district and holding other variables constant, farmers from Busia district had their probability of raising exotic cattle reduced by 0.4019. Also, the parameter of being married is statistically significant (($p<0.01$). This shows that when compared with those that were not married and taking all other variables constant, married farmers had their probability of raising dairy cattle being higher by 0.2592. In a typical East African household, being married puts a lot of financial pressure on the household heads, which may also motivate desire for raising dairy cattle due to their high productivity. It may as well imply that married household heads have a pull of family labour from where labour time for attending to dairy cattle can be drawn.

The parameter of number of boys is statistically significant ($p<0.01$). This implies that if the number of boys within the households increases by one unit, the probability of raising exotic cattle breed would increase by 0.0778. This is expected because of the labour that boys can supply in

dairy cattle, especially with finding feeds. This can generally be linked to household size which Teklewold *et al.* (2006) found to be a significant variable influencing ownership of exotic poultry breed in Kenya. Also, the parameter of generating incomes from bricks, charcoals and firewood is statistically significant ($p<0.10$). This implies that farmers with access to incomes from bricks, charcoals and firewood had their probability of raising dairy cattle reduced by 0.1241. This is an indication that involvement in such secondary income generating activities can result in having lesser time to attend to dairy cattle which are often more fragile.

Also, the parameter of number of cattle owned is statistically significant ($p<0.01$). This implies that if the number of cattle owned increased by one, the probability of raising dairy cattle will reduce by 0.1194. This is expected due to several production risks associated with raising dairy cattle when compared with local or indigenous breeds. In some instances, farmers raising dairy cattle are mandated to take insurance due to higher mortality, especially if drought makes food and water to be less available. The parameter of having food problem is also statistically significant ($p<0.05$). This implies that households that reported food problems had their probabilities of raising dairy cattle decreased by 0.3160. This is expected because of high maintenance cost of dairy cattle. Households that operate at the verge of poverty will not be able to meet the expected high maintenance cost of dairy cattle.

CONCLUSION

Dairy cattle produce more milk than indigenous ones and their husbandry had been encouraged in Kenya more than 10 decades. The relevance of agricultural sector to Kenya's economic growth and development portends a need for ensuring adoption of highly productive dairy cattle for milk production. In this study, it was established that cattle owned by farmers slightly increased between 2005 and 2008 among indigenous and dairy breed. The results further pointed at the relevance of pull of family labour in dairy milk adoption behavior. This however raises further question since experience of food problem, which is likely to be more pronounced among large family sizes reduced probability of adopting dairy cattle. Therefore, integrated efforts to reduce persistent hunger and poverty among smallholder farmers in rural Kenya will go a long way in enhancing households' decisions to keep dairy cattle.

ACKNOWLEDGMENTS

The permission granted by International Food Policy Research Institute (IFPRI) to use the data set is gratefully acknowledged. Opinions expressed in this study are not those of IFPRI or the Institution to which the author belongs.

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